

B.15 MARS FUNDAMENTAL RESEARCH

1. Scope of Program

The Mars Fundamental Research (MFR) program seeks to sponsor the best and most innovative scientific research concerning atmospheric, climatological, and geologic processes on Mars, and, in doing so, offer opportunities to researchers interested in Mars who are not yet prepared to work exclusively with actual mission data.

The MFR program includes investigations that use: (i) theoretical and experimental studies to investigate the coupled atmospheric and geological systems on Mars; (ii) quantitative terrestrial field experiments that improve understanding of the *in situ* measurements that have been or that will be made on Mars; and (iii) any other innovative research activities that demonstrate relevance to NASA's overarching goals for the scientific exploration of Mars. As such, this program solicitation is intentionally broad, with only a few ground-rules and boundary conditions, as follows:

- 1) Investigations submitted to this program must demonstrate how the research to be undertaken will directly improve our understanding of Mars relative to current knowledge;
- 2) Research activities must not duplicate those that involve analysis of flight mission data (such investigations may be submitted to the companion Mars Data Analysis program, Program Element B.5 in this NRA);
- 3) All proposed research must demonstrate relevance to the overarching scientific research directions of the Mars Exploration Program (MEP; see Web site <http://mars.jpl.nasa.gov>), as summarized in the July 2001 Mars Exploration Payload Analysis Group (MEPAG) report in JPL Document 01-7 at <http://mars.jpl.nasa.gov/tech/sciencestrategy.pdf>, as well as in the recent Space Studies Board report of the Committee for Planetary Exploration (COMPLEX) at <http://www.nationalacademies.org/ssb/bib1.html#2001>;
- 4) Research involving field experiments must demonstrate how the proposed activities directly relate to current questions about the environment of Mars;
- 5) Laboratory experiments submitted to this MFR program must relate directly to questions about the Martian environment and Mars-relevant materials and must clearly demonstrate the uniqueness of the approach;
- 6) Proposals to develop basic geochemical, biogeochemical, and geophysical datasets for Mars-relevant materials are permitted provided there is sufficient justification for such measurements in the context of the MEP during the coming decade (such as for the 2009 Mars Science Laboratory (MSL) mission for which instrument investigations will be competed in 2004);
- 7) Investigations in this program must NOT be posed as extensions of flight experiments that are part of ongoing or soon-to-be active science missions; rather investigators must state how any proposed activities that pertain to current or

future flight missions are independent of those to be pursued by the typical mission-related science team activities;

- 8) Investigations using innovative information technology (IT) approaches for understanding Mars as a system, including field experiments that clearly demonstrate the potential of IT solutions to substantially increase the scientific yield (and scope) of planned investigations, are permitted (e.g., IT developments that could radically improve the time required for field deployable rovers to approach rocks and other interesting targets, etc.), provided that scientific products are proposed as an end product (that is, technology demonstrations are not relevant to this NRA); and
- 9) Topical science conferences, workshops, and symposia related to the MFR program may also be proposed as part of a “parent” research investigation submitted to this program.

As part of this research solicitation, NASA encourages innovative research approaches involving the full spectrum of possibilities listed above in items (1) – (9) above, as well as others that can be scientifically justified.

Note that to enable the NASA Office of Space Science to properly evaluate the relevance of proposals submitted to its programs, as well as track its progress towards achieving its goals as mandated by the Government Performance Review Act (GPRA) of 1993, all research supported by NASA’s programs must now demonstrate its relationship to NASA Goals and Research Focus Areas (RFAs) as stated in the latest version of its Strategic Plan (follow links from the Web site <http://spacescience.nasa.gov/>); see also the discussion in Section I of the *Summary of Solicitation* of this NRA. Therefore, all proposers to this program element are asked to state their perception of this relevance in terms of the Goals, Science Objectives, and RFAs given in Table 1 found in the *Summary of Solicitation*. In particular, this program element is designed to help fulfill all of the RFAs for the Science Objectives 4, 5, and 6 for Goal II of the Solar System Exploration science theme. The appropriate place for this statement of relevancy is in the introduction to the proposal’s *Scientific/Technical/Management* section (see Section 2.3.5 in the *Guidebook for Proposers*). The index numbers in this table may be used to identify a specific RFA, for example, “Goal I, Sun-Earth Connection Theme, RFA 1(c)” or “Goal II, Astronomical Search for Origins, RFA 3(b).”

1.2 Background

NASA’s Mars Exploration Program (MEP) (<http://mars.jpl.nasa.gov>) is a science-driven program that focuses on understanding the planet Mars as a “system.” The MEP is characterized by a suite of core program flight missions, as well as fully-competed Scout missions, whose aim is to provide new observational and measurement data concerning Mars.

NASA's Mars Data Analysis (MDA) program (Appendix B.5 in this NRA) treats research that is based upon flight mission data from the suite of flight experiments that have flown or are currently collecting data concerning Mars. Key to understanding Mars as a dynamic system in space and time are a broad variety of fundamental research investigations, some of which are not directly linked to the flight experiment data that have either recently been collected or will be in the near future (e.g., by the Mars Pathfinder (MPF), Mars Global Surveyor (MGS), Mars Odyssey (MO), and Mars Exploration Rover missions).

1.3. Sources of Information and Data

It is the responsibility of the investigator to acquire any required data needed to complete his/her investigation. Therefore, before submitting a proposal, each proposer should determine that the required data are or will be available. MPF, MGS, and MO, as well as data from previous Mars missions, are available from the Planetary Data System (PDS), whose home page can be accessed at <http://pds.jpl.nasa.gov/>. Proposers who wish to use photographic and cartographic materials may find such data at the nearest Regional Planetary Image Facility (RPIF) whose locations are listed on the RPIF home page at URL <http://cass.jsc.nasa.gov/library/RPIF/RPIF.html>.

Documents that describe the research priorities for Mars exploration include *Assessment of Mars Science and Mission Priorities* [2001], prepared by the Committee on Planetary and Lunar Exploration (COMPLEX) of the Space Studies Board of the National Research Council, and published by the National Academy Press in November 2001. This document includes summaries of Mars scientific priorities from the Mars Exploration Payload Analysis Group, former reports by COMPLEX, and others. These documents are available from the Space Studies Board, National Research Council, 2101 Constitution Ave, NW, Washington DC 21418.

Goals, Objectives, Investigations, and Measurement Priorities for Mars Exploration [2001], given in the MEPAG report and included in the JPL document JPL 01-7 (July 2001), is available on-line at <http://mars.jpl.nasa.gov/tech/sciencestrategy.pdf>, as well as via the NASA HQ Mars web site at: <http://www.hq.nasa.gov/mars>.

Finally, a special collection of research articles was published in the journal Nature, Volume 412, No. 6843, 12 July 2001, pp. 207-253, that includes invited review articles about the state-of-the-art with respect to current thinking about key areas of Mars research.

2. Programmatic Information

It is anticipated that approximately \$2.3M will be available for this program in FY04, which is expected to support 30-40 new investigations. Proposals may request periods of performance of up to three years duration.

As a change from past practices for this program, and in anticipation of a new master data base for OSS research awards that is being implemented on an evolving basis, *Annual Progress Reports* (called "Progress" or "Status" Reports in previous research solicitations) for ongoing multiple-year awards are no longer required at the time that new proposals are due. Instead, a single *Annual Progress Report* will be due no later than 60 days in advance of the anniversary date of the award and is to be submitted as an attachment to an E-mail message to the Program Officer for this program. Note that as an additional change from past practice, a revised budget for any remaining years of an approved award is neither necessary nor expected; the multiple year budget approved at the time of the original award is considered binding barring the development of unforeseen, extreme issues (see Section D.4 of Appendix D of the *Guidebook for Proposers* for further details).

- *Instrumentation*

The *Planetary Major Equipment* program described in Appendix B.12 of this NRA allows proposals for upgrading the analytical, computational, telescopic, and other instrumentation required by investigations for certain programs sponsored by the Solar System Exploration Division, including this one. New, analytical instrumentation requests, as well as requests for upgrades to existing instruments, costing more than \$25,000 should be identified and requested in a special section of each proposal, to be titled "Major Equipment Request." However, note that a Planetary Major Equipment proposal must be affiliated with a "parent" OSS research proposal in order to be considered; see Appendix B.12 for details.

IMPORTANT INFORMATION

As discussed in the *Summary of Solicitation* of this NRA, the Office of Space Science (OSS) is now using a single, unified set of instructions for the submission of proposals. This material is contained in the document entitled *NASA Guidebook for Proposers Responding to NASA Research Announcement – 2004* (or *NASA Guidebook for Proposers* for short) that is accessible by opening URL <http://research.hq.nasa.gov>, and linking through the menu item "Helpful References," or may be directly accessed online at URL <http://www.hq.nasa.gov/office/procurement/nraguidebook/>. This NRA's Summary of Solicitation also contains the schedule and instructions for the electronic submission of a *Notice of Intent* (NOI) to propose and a proposal's *Cover Page/Proposal Summary/Budget Summary*, and the mailing address for the submission of a proposal.

Questions about this program element may be directed to the cognizant Program Officer:

Dr. Herbert Frey
Solar System Exploration Division
Code SE
NASA Headquarters
Washington, DC 20546-0001

Telephone: (202) 358-2520
Facsimile: (202) 358-3095
E-mail: Herbert.V.Frey@nasa.gov
